AMENDMENTS TO THE CLAIMS

1. (Canceled)

2. (Canceled)

3. (Canceled)

4. (Canceled)

5. (Canceled)

6. (Canceled)

7. (Canceled)

8. (Canceled)

9. (Canceled)

10. (Canceled)

11. (Canceled)

12. (Canceled)

13. (Canceled)

14. (Canceled)

15. (Previously Presented) An absorption region of an avalanche photodetector, said absorption region having a top and a bottom and including a P-type dopant impurity therein, such that

$$\frac{k_\beta T}{q} \frac{\partial}{\partial x} \ln(N_A(x)) \geq 3kV / cm$$

in which k_β is the Boltzmann constant, T represents operating temperature of said photodetector in degrees Kelvin, q is the fundamental unit of charge, N_A represents concentration of said P-type dopant impurity, and x represents distance from one of said top and said bottom, wherein a charge layer is interposed between said absorption layer and a multiplication region, and said charge layer is formed of substantially the same material as a first multiplication layer disposed adjacent said charge layer.

16. (Original) The absorption region of an avalanche photodetector as in claim 15, in which said absorption region is a layer of InGaAs.

17. (Original) The absorption region of an avalanche photodetector as in claim 15, wherein said P-type dopant impurity comprises one of zinc and carbon.

18. (Original) The absorption region of an avalanche photodetector as in claim 15, further including a multiplication layer disposed beneath said absorption region and in which said x represents distance from said bottom.

19. (Currently Amended) An avalanche photodetector comprising an absorption layer having a top and a bottom, a multiplication region disposed facing said bottom and including at least one multiplication layer, and a charge layer interposed between said absorption layer and said multiplication region and formed of substantially the same material as a first multiplication layer disposed adjacent said charge layer, said absorption layer including a P-type impurity therein, wherein said P-type impurity comprises one of zinc and carbon, and a P-type impurity concentration gradient such that said P-type impurity concentration decreases from said top to said bottom and <u>satisfies</u>

$$\underline{\frac{k_\beta T}{q}\frac{\partial}{\partial x}\ln(N_A(x)) \geq 3kV/cm}$$

<u>in which k_β is the Boltzmann constant, T represents operating temperature of said photodetector in degrees Kelvin, q is the fundamental unit of charge, N_A represents said P-type impurity concentration, and x represents distance from said bottom.</u>.

20. (Original) The avalanche photodetector as in claim 19, wherein said absorption layer is formed of InGaAs.

21. (Canceled)

22. (Canceled)

23. (Original) The avalanche photodetector as in claim 19, in which said absorption layer includes a thickness within the range of 0.1 to 0.6 microns.

24. (Previously Presented) The avalanche photodetector as in claim 19, wherein said charge layer includes dopant impurities therein.

25. (Previously Presented) The avalanche photodetector as in claim 20, wherein said charge layer is formed of InAlAs and interposed between said absorption layer and said multiplication region, said multiplication region composed of an InAlAs multiplication layer disposed adjacent said charge layer and an InGaAlAs multiplication layer.

26. (Original) The avalanche photodetector of claim 25, in which said P-type impurity concentration gradient satisfies

$$8kV/cm \geq \frac{k_\beta T}{q} \frac{\partial}{\partial x} \ln(N_A(x)) \geq 3kV/cm$$

in which k_β is the Boltzmann constant, T represents operating temperature of said photodetector in degrees Kelvin, q is the fundamental unit of charge, N_A represents said P-type impurity concentration, and x represents distance from said bottom.

27. (Original) The avalanche photodetector as in claim 19, further comprising a graded transition region disposed between said absorption layer and said multiplication region, said graded transition region being a graded-bandgap material, including a graded conduction band energy level that produces a gradual change between a first conduction band energy level of said absorption layer and a second conduction band energy level of said multiplication region.

28. (Previously Presented) An avalanche photodetector comprising an absorption layer, a multiplication region and a charge layer disposed between said multiplication region and said absorption layer, said multiplication region consisting of only two multiplication layers including a first multiplication layer formed of a relatively wide bandgap material and disposed closer to said absorption layer and a second multiplication layer formed of a relatively narrow bandgap material and disposed further from said absorption layer, said first multiplication layer and said second multiplication layer having a combined thickness of at least 0.2 microns and a charge layer thickness is no greater than 10% of said combined thickness, and wherein said first multiplication layer is formed of substantially the same material as said charge layer.

29. (Canceled)

30. (Currently Amended) The avalanche photodetector as in claim ~~29~~ 28, wherein said charge layer includes dopant impurities therein to produce an abrupt step in electric field strength.

31. (Original) The avalanche photodetector as in claim 28, wherein said charge layer and said first multiplication layer are formed of InAlAs, said second multiplication layer is formed of InGaAlAs, and said absorption layer is formed of InGaAs.

32. (Canceled)

33. (Original) The avalanche photodetector as in claim 28, further comprising a graded transition region disposed between said absorption layer and said charge layer, said graded transition region being a graded-bandgap material including a graded conduction band energy level that produces a gradual change between a first conduction band energy level of said absorption layer and a second conduction band energy level of said first multiplication layer.

34. (Original) The avalanche photodetector as in claim 28, in which said absorption layer includes a top and a bottom facing said multiplication region and includes a P-type impurity therein, said absorption layer including a P-type impurity concentration gradient decreasing from said top to said bottom.

35. (Original) The avalanche photodetector as in claim 28, in which each of said first multiplication layer and said second multiplication layer includes a thickness of at least 0.1 micron.